Northwestern Virginia (B & O) RR.,
Grafton Machine Shop and Foundry
Grafton
Taylor County
West Virginia

HAER WV-10

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

PHOTOGRAPHS

REDUCED 8" x 10" DRAWINGS

Historic American Engineering Record
National Park Service
Deaprtment of the Interior
Washington, D.C. 20240

HISTORIC AMERICAN ENGINEERING RECORD

GRAFTON MACHINE SHOP AND FOUNDRY

WV-10

Location:	West Virginia Grafton Quad 17.5843604354730
Date of Construction:	1853-1854
Original Owner:	Northwestern Virginia (later Baltimore and Ohio) Railroad
Present Owner:	The Chessie System
Significance:	Built by the Northwestern Virginia Railroad, a subsidiary of the B&O, this complex was the major repair facility on the western portion of the line. Grafton was one of the earliest railroad towns.
Historian:	Dennis M. Zembala, 1975

The story behind the construction of the Northwestern Virginia Railroad Machine Shop and Foundry illuminates the relationship between railroad technology and managerial practices during the experimental phase of railroad history. The organization of the Northwestern Virginia Railroad as an independent corporation, financially controlled by the Baltimore and Ohio Railroad, was one of the earliest uses of this technique as a method of promoting the railroad's freedom from political control. Forced by political pressure to make Wheeling its first terminus on the Ohio River, the Baltimore and Ohio formed the Northwestern Virginia to add to its route a more desirable line to the west. Once the Virginia legislature had acceded to Wheeling's pressure, it could hardly do less for other towns. The year following the arrival of the Baltimore and Ohio in Wheeling (1852), a group of businessmen in Parkersburg was granted a charter for the formation of the new road, thus firmly establishing the railroad's importance to furture urban growth and industrialization. After the Civil War, other railroads used this technique to take advantage of the rivalry between cities and towns. Through it, they gained a measure of freedom in the location of their lines and repair facilities (and, in some cases, gained cash subsidies). The machine shop and foundry at Grafton reminds us that this technique was based on an advanced technology. Since many of these communities were less than a generation removed from a frontier society, such a repair complex was, in a sense, a technological outpost in a primitive world. It served as an umbilical cord to a society which many had left behind and as a reassuring symbol of their ability to control the natural environment. It is easy to see why communities were eager to collaborate in bringing the railroads to their towns at a time when natural forces were still overwhelming.

The decade of the 1840s was marked by a thorough re-evaluation of the role of the railroad in a national transportation network. The case of the Baltimore and Ohio Railroad is an example of the general trend toward the adoption of an all-rail concept. The original idea of a railroad linking the port of Baltimore to the rapidly increasing Ohio River trade entailed a terminus at any navigable port on the river - hence, the name - Baltimore and Ohio. By the 40s, the concept of the railroad as an auxiliary to a system of navigable waterways had been abandoned. The successes of the 1830s, both here and abroad (particularly in England), had given railroad directors a more lofty conception of their role in a national transportation network. Improvements in the size and dependability of motive power, innovations in bridge and track design and the general independence from seasonal weather fluctuations led to acceptance of the all-rail concept as a replacement for canals and rivers in the national network. Consequently, by 1842, the B&O had revised its own goals to include an all-rail line through Cincinnati with a terminus at St. Louis.[1] These developments involved the B&O in a series of legal and political conflicts which led to the formation of the Northwestern Virginia Railroad.

The 1838 extension of the original charter from the State of Virginia revealed the attempt by Virginia legislators to retain a concept of a national transportation network based on mixed modes. While the original charter of 1827 granted the railroad permission to meet the Ohio River at any point north of the mouth of the Little Kanawha, the revision stipulated that its terminus be at Wheeling, the chief rival of Pittsburgh in the growing river trade. In granting the port of Baltimore the commercial advantages of a link to Wheeling, the Virginia legislatures assumed that the river would continue to be an important link in a national transportation network. The rationale for such a concession was based on the belief that trade

lost to Virginia's eastern port would at least contribute to the development of Wheeling as a major commercial and industrial center. Consistent with this belief, the 1838 law authorized the city of Wheeling to raise $1,000,000 toward the construction of the line from Harpers Ferry. When the five-year extension ran out in 1843, the line had been completed only to Cumberland. Due to delays in financing, the second extension was not granted until 1847. In this act, the Virginia legislature indicated that the railroad should enter the ravine of the Ohio River at a point north of the mouth of Fish Creek, and that a more northerly route would be preferable. The railroad should meet the river north of Grave Creek, if possible, even though more costly, and the city of Wheeling would reimburse the company for the added expenses. These negotiations over the proposed route revealed a growing concern on the part of the city for its own commercial position, revealing an increasing awareness that the railroad's idea of its own role in a national transportation network had changed and was no longer consistent with the city's concept of a combined railway-waterway system.

The conflict of these two concepts emerged most clearly as a result of the surveys undertaken from 1844-48 preliminary to extension of the road to the Ohio River.[2] During the summer of those years, the B&O's chief engineer, Benjamin H. Latrobe, Jr., directed the activities of three corps of surveyors. These teams plotted the territory between Cumberland and the Ohio, exploring the possible routes with termini between Wheeling and Parkersburg (at the mouth of the Little Kanawha) 96 miles to the south. By 1844, these engineers had located five ostensible routes. The northernmost of these had a proposed terminus on the Ohio 40 miles south of Wheeling![3] It was obvious that while the railroad was willing to extend the road to Wheeling, its main objective was the most direct route west to Cincinnati

and St. Louis. Wheeling's concern at these developments led to its proposal of an alternative route surveyed by Jonathan Knight. A former B&O chief engineer and then resident engineer in Wheeling, Knight's route diverged from Latrobe's northerly one at a point on Buffalo Creek and met the Ohio at Moundsville, 12 miles south of Wheeling. It was a more difficult route requiring high grades, extensive excavations and tunneling - conditions far less favorable to the railroad. President Thomas Swann applied to the legislature for relief of these onerous provisions in 1850. As a result, a board of three independent engineers - non-resident in Maryland, Virginia, Pennsylvania, and Ohio - was appointed to settle the dispute. When this board rendered a decision in favor of Knight's Grave Creek route, the railroad was faced with the prospect of either following it or of never getting to the Ohio at all. In a general meeting of stockholders in May 1850, President urged the directors to acced to the Wheeling route and finish the railroad to the Ohio as soon as possible.

The subsequent successes of the B&O indicate that some very creative and ingenious policies emerged from the forge of this controversy over routes. What first becomes apparent is that the railroad's situation was not as black as it might have seemed. The line east of Piedmont was yielding increasing revenues. The developing coal industry of the Cumberland Basin and the flourishing agriculture of western Maryland both owed some debt to the B&O. In spite of its large outstanding debt, the completion of the line to the Ohio was probably not an indispensible factor for its future financial well-being. The initial outlays of fixec capital during the early experimental years had been large but the failure of the company to pay dividends was due mainly to reinvestment of profits in upgrading and extending

the line west.[4] By 1847, the company was firmly established as an enterprise of great importance to the city of Baltimore and the State of Maryland. Swann and his aides were undoubtedly aware of this when the decision was made to follow the Grave Creek route and push the road to Wheeling.

The completion of the line to Wheeling was less the result of any feeling of manifest destiny implicit in its founding charter than of the calculation of real economic advantage. While Swann and the major proponents of expansion were by this time committed to the idea of an rail-link to Cincinnati and St. Louis, they undoubtedly realized the positive aspect of a connection to Wheeling as well. As much as the all-rail concept might hold the imagination of railroad men, the hard realities were that river traffic was increasing, not decreasing. In addition, Wheeling, in the 1840s, was not only a depot of the river trade, but a growing commercial and manufacturing center. Hence, in the short run, the road to Wheeling had the prospects of paying a handsome dividend.

Perhaps the most significant part of dividend yielded by completion of the road to Wheeling was that Swann and his associates gained a highly favorable bargaining position viz a viz the Virginia legislature. Having imposed its will upon the railroad, Wheeling, in a sense, had set a precedent which ultimately was used to its detriment. In acceding to the city's wished on the railroad link, the legislature established the importance of the railroad to future local urban growth. Having done so, the legislators could hardly refuse similar demands by other cities and towns. The B&O found in this situation a valuable tool with which to extricate themselves from the narrow and difficult path to Wheeling. In short order, a group of Parkersburg businessmen, with financial backing from the railroad, appeared

in Richmond to petition for similar favors for their town. Whether or not Swann and his aides realized this fact in 1850, when they decided to build Wheeling, is debatable. That they did not seem unlikely in view of the diplomatic skills they had previously displayed exploited the situation indicates that it may even have been part of a tacit agreement in May of 1850. Late in 1852, construction of the Northwestern Virginia railroad from Grafton to Parkersburg was underway.

On February 14, 1851, the Virginia Legislature granted a charter to the Northwestern Virginia Railroad Company to build a line from Grafton to Parkersburg at the mouth of the Little Kanawha River.[5] The petitioners were residents of Parkersburg and they became its first officers, but it was obvious that the B&O Railroad was behind it from its inception. James Cook of Parkersburg became the first president. Other Parkersburgers were the directors: George Neale, Jr., Jefferson Fibbons, Jonathan M. Bennett, William Logan and Joseph Spencer. But the chief engineer was Benjamin H. Latrobe, Jr., the chief architect of the B&O west of Harpers Ferry. In September 1851, before the line to Wheeling had been completed, Latrobe was already surveying the area between Grafton and Parkersburg. And, while the original stock was subscribed in Parkersburg, the construction was financed mainly with B&O money. The city of Baltimore guaranteed a $1,500,000 loan in 1852, and the B&O itself provided a similar amount.[6] In May of 1853, Thomas Swann resigned as the B&O's president and replaced James Cook as president of the Northwestern Virginia Railroad. From 1853 until 1857, Latrobe and his assistants, George Hoffman, J. C. C. Hoskins, and Albert Fink was busy supervising the progress of the new road. William Burton, who had been the B&O's superintendent of construction, served the Northwestern Virginia in the same capacity. By July of 1856, the road was ready for the laying of the rails.[7*]

The fiction of separate corporate identities in no way hindered the extension of the road to Parkersburg. The directors of the new road were concerned only with the advantages which would accrue to their city on the arrival of the B&O. Consequently, they cooperated in every way and were perfectly content to leave the details of construction and finance to Swann and Latrobe. The B&O kept its grip on the new road through its financial structure. Shutting off the sources of new capital just as the road was ready to be railed provided the means for adding to the Northwestern Virginia to the B&O's network. In 1856, the two companies signed an agreement whereby the B&O would complete the road and operate it on a contractual basis for five years beginning February 1, 1857.[8] The following year, the B&O purchased the machine-shop at Grafton for $112,330.04, the sum to be applied to the outstanding debt owed to the parent company. In 1865, the Northwestern Virginia was finally sold at foreclosure to the B&O. It had no rolling stock worth mentioning and had been run by the parent company since 1857.

The history of the Northwestern Virginia Railroad set a pattern for the subsequent expansion of the Baltimore and Ohio and was followed by other roads as well in the great post-Civil War railroad boom. By forming new corporations, the parent company could use local enthusiasm for the railroad to circumvent the antagonism of state legislatures against corporations chartered in competing states. Flotation of new stock issues was also a better way for companies such as the B&O to raise capital. Increasing capital shares and the issuance of second mortgage bonds by the parent company was less desirable since the markets for such issues were appreciably less due to heavy fixed capital expenditures. Through subsidiary companies, such as the Northwestern Virginia, it could advance large sums toward

new construction without endangering its own credit, while, at the same time, reserving effective control.[10] While the origins of this technique have not been adequately traced (it is very likely that they had British antecedents), the case of the Northwestern Virginia must certainly be one of the earliest examples in this country. It emerged from the political and economic crucible of the route controversy between the Baltimore and Ohio and the city of Wheeling. Its subsequent spread indicates its effectiveness as a tool of management as the concept of an all-rail system gained currency.

Construction of the Northwestern Virginia Railroad from Grafton to Parkersburg was a true challenge to the techniques which Latrobe and his aids had evolved on the road west of Cumberland. Threading the line though more than a hundred miles of difficult mountainous terrain called for numerous tunnels and bridges. A workshop was needed to supply the materials for such structures, and, consequently, one of the first projects of the new company was the erection of the machine shop and foundry at Grafton. The reason given by Latrobe for the location at Grafton was its nearness to the two major bridges which would have to be erected; but the size and permanence of the building clearly reveal that it was intended to be the nucleus of a major repair center. Built during the course of 1853, it was equipped and operating early in 1854. In that year, the masonry piers for the bridge over the Tygart's Valley River were complete and those for the Monongahela River Bridge at Clarksburg nearly so. The shop was fitted out with the necessary machinery, "forge, lathes, screw cutters, planing machines, etc.," and began turning out wrought and cast iron members for the superstructures.[11]

The Grafton Complex

The structure of the Grafton Machine Shop is an interesting document of an experimental phase in the development of American structural. (WV-10-10) Its walls are of rubble masonry construction two feet thick and were built of local sandstone from a nearby quarry. Overall, the structure measures 256 feet by 50 feet six inches (exterior dimensions) and is divided into three main sections. A central pavilion of two stories, (54 feet 9 inches x 59 feet 11 inches, external dimensions) five bays wide, projects slightly from both longitudinal walls. In typical Georgian fashion, its gable-end extends above the eaves to provide relief from the overall linearity of the structure. (See Drawings of Elevation, HAER Sheet 3 of 5.) The upper floor of this section was used recently as office space and it is likely that that was its original function as well. An interior staircase originally provided access to the offices, but this was later removed and replaced by an outside staircase added to the rear of the building. (See photocopy of old view (1876), HAER WV-10-3 and HAER Drawing of plan. Sheet 2 of 5.)

The organization of the interior space at the ground level was typical of foundry and machine shop practice of the period and was designed to permit convenient movement through the stages of the process itself. The eastern portion of the building now serves as a welding shop and was probably the location of the original foundry. Nothing remains of the original machinery, and a concrete floor covers all traces of the original organization. Two small blacksmith's forges, a boom crane, a large pair of shears and the base of an old steam hammer are the only remnants of a later stage of development. Since the foundry originally produced castings, it probably contained at least one reverberatory furnace or a cupola

furnace (perhaps both). The furnace was probably housed in the small wing (16 feet x 21 feet 4 inches in diameter) projecting from the rear of the foundry.* The interior of this space is open to the roof joists and there is no indication of its having been subdivided in height. It was here in the foundry that all repairs and new heavy-metal construction began. Since Grafton was later a major repair center, this work would have included boiler work, wheel and axle forging, and the manufacture of other large parts. Once components were cast or forged, they would have been taken to the machine shop for finishing. The machine shop occupied the remaining ground floor space of the building and is separated from the foundry by a heavy masonry wall.** The machine shop contained the lathes, shapers, screw-cutters, planers and grinders necessary for finishing work. The heavy-timber frame which supported a system of line-belts and shafts for power transmission still remains, supported by metal columns 6 inches in diameter. The columns are probably later in date and the frame itself is independent of the roof trusses. (WV-10-20) Nothing remains to indicate the location of the original power source for this system, but an old photo shows that by 1876 a steam engine was located in a shed adjacent to the rear of the main building. (WV-10-3)

One of the most significant engineering features of the Grafton machine shop and foundry is its roof trusses. Spanning the entire width of the structure (46 feet 7 inches, interior dimensions), these are tricomposite trusses of timber, wrought iron and cast iron (14 feet 4 inches on center). It is likely that these are the earliest surviving examples of this type of construction. The tri-composite

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* This early addition is present in the 1876 view.

** Although access to the machine shop from the foundry is now provided by a small door, this is clearly not original. It is possible that there was originally no interior connection because of the heat generated in the foundry.

truss, composed of a double-membered top chord of timber, a wrought-iron bottom chord and two cast-iron diagonals marks a transition from wood to metal structures[12] (see Truss Details Drawing, HAER, Sheet 5 of 5). The development of the truss concept in bridge construction and the increased availability of iron led to its use in buildings as well. Wrought iron was employed particularly where use demanded a large open space free from intervening columns. Cast and wrought iron also resisted fire and were particularly appropriate for a building which contained a foundry. The experience of the B&O engineers with iron bridges made the decision to use iron in the machine shop trusses a logical and relatively easy one. Wendell Bollman and Albert Fink, both members of the B&O engineering staff, were two of the most prominent iron bridge builders of their day. In the Grafton machine shop, one or both of these men used this skill and experience to solve an architectural problem. The gradual accumulation of such experience had its ultimate ramifications after the Civil War in the metal-framing techniques of building construction (it was no accident that such buildings manifest themselves most obviously in Chicago, which was, by the turn of the century, the largest railroad junction in the world).

During the construction of the Northwestern Virginia Railroad, the Grafton machine shop provided all the iron work and much of the wood work for the bridges, water stations, and station buildings along the route (it apparently included a sawmill).[13] During this time, a frame half-roundhouse was built to the west of the machine shop. (See photocopy of old view HAER WV-10-1.) Sufficient ground was acquired northwest of the roundhouse for the connection of the two roads and additional space east of the machine shop was set aside as a marshalling yard.[14] In 1857, when the line to Parkersburg was complete, the B&O purchased the Grafton

shops and moved its own shops from Fetterman, where a temporary quarters had been constructed in 1852.[15] The Grafton shops subsequently became the major repair center for the engines and cars on the Parkersburg branch and the main line west of Piedmont. Additional motive power for the difficult Cheat River grade was also located here.

After the Civil War, the Grafton shop complex grew in importance as the western lines of the B&O were extended. In 1867, the timber half-roundhouse was razed and a larger brick roundhouse was built.[16] One of several similar structures built in this period, it was sixteen sided with a radial roof surmounted by a circular ventilating monitor in the center. (WV-10-2) The old turntable which had been outdoors formed the interior center of the new structure. The central monitor over the turntable was bell-shaped and was probably supported by a frame of cast iron struts leaning inward at an angle. In the almost-identical roundhouses at Martinsburg (one of which still retains its original form) these struts were octagonal, rising at an angle of 48.2 degrees to a compression ring of 16 arched, cast-iron bracket beams. (Historic American Engineering Record B&O Railroad Survey, Martinsburg Roundhouse, p. 3, Photo WV-1A-___. The sophisticated structure and the geographical distribution of this type illustrates the increasing importance of Grafton as a major repair center. In 1865, the company began a major repair program which included the repair and modernization of the machinery and the pattern shop and the construction of several new buildings.[17] The original turntable in the roundhouse was replaced by a new wrought iron one in 1881 to accomodate larger locomotives.[18] By 1911, the flat bottom land of Three Forks Creek had become so crowded that the construction of new car shops forced the company

to extend the north bank of the creek with landfill. In that year, a quarter-roundhouse was built to supplement the existing facility, [19] and just prior to World War I, the older roundhouse was demolished and the quarter-roundhouse extended to a semi-circle attached to the western end of the machine shop.[20] Evidently, by this time, the increasing size of locomotives had made the smaller bays of the older structure obsolete.

The survival of the machine shop at Grafton suggests some interesting aspects in the history of railroad technology. Unlike the roundhouses, the machine shop retained its essential form. Through relatively minor modifications, the company was able to modernize it to keep pace with the rapidly developing technology of its rolling stock. Machine shop practices by 1860 had already assumed an efficient form which would remain unchanged for some time.[21] Subsequent progress in such techniques required no large increases in space since new machines could be conveniently fit into that of their predecessors. In fact, developments such as the oxy-acetylene welding and cutting process and the standardization of parts eliminated some of the early machine shop functions. As a result, the Grafton machine shop remained useful well into the 20th century.

The establishment of a major railroad repair center at Grafton is of no little importance in the general pattern of American transportation history and the history of industrialization. Grafton was only one of numerous examples of towns which owed their origins and prosperity to the railroad. In 1853, three years after it was settled, Grafton's population was only 153 persons.[22] But the growth of the railroad and the necessity for increasing maintenance facilities provided more and more jobs until, by 1900, it was the seat of Taylor County with a population of 5,260.[23]

Before the advent of the sleeping car, the town was a major overnight stop for passengers. Grafton House, the original station-hotel at the junction of the two lines, was completed by the Northwestern Virginia in 1857. (WV-10-9) A correspondent of the Cincinnati Sentinel described it as ". . .a hotel par excellence. . . not to be surpassed upon any line of the country." Its dining room was gas-lighted and offered a gourmet menu; its rooms were "the acme of comfort."[24] Large and stopped to spend a few hours or a few days. The surrounding scenery was some of the best the Allegheny Mountains had to offer. Less than a day's ride from Baltimore, Grafton had access to that city's commercial and financial resources. In short, the new town seemed to have tremendous potential to become a major population center.

Developments after the Civil Was prevented Grafton from fulfilling the initial hopes of its projectors and consigned it to a more limited role. The industrial and economic diversity necessary for growth during this period never materialized and it remained primarily a railroad town. In 1871, the opening of the Pittsburgh and Connellsville branch decreased the importance of the Wheeling Branch and of Grafton's function as a junction. Thereafter, its growth was linked to that of the Parkersburg-Cincinnati-St. Louis link. In 1860, petroleum was discovered in the area of the Little Kanawha River, and from 1880, the coal seams of Fairmont and Clarksburg began to be developed. The resulting growth in the volume of traffic meant that Grafton's shop complex was greatly expanded. A stroll through contemporary Grafton reveals that the peak of this expansion was reached in the 1890s. Nearly all the major commercial and domestic buildings date from that period. By World War I, the development of the Grafton shops had reached a point of stasis. Period photographs show that, visually at least, the town had evolved into the form which it retains today. (SV-10-22)

Interest in the technical and economic development of the Grafton shop complex should not be pursued to the detriment of its social and cultural impact. The early history of the town suggests that it might urban and regional history as well. Access to eastern markets encouraged local farmers to produce cash crops and gradually eliminated subsistence agriculture in the region. On the other hand, the railroad meant easier access to western farmland for would-be settlers. During construction of the road, Chief Engineer Latrobe constantly lamented that he had trouble keeping a full crew on the job. The laborers would no sooner be transported to the railhead than they would disappear into the forests, intent on cutting farms from the wilderness. In the late 1840s and early 50s, when the line was being pushed west from Cumberland to Wheeling, many of these laborers were Irish immigrants. The patterns of their settlement in the region have never been explored. Many of them became permanent residents of towns like Grafton and their association with the railroad continued into the second and subsequent generations. From a slightly different point of view, the importance of the Grafton shops in building a local base of technical expertise and inclination probably had a "spin-off" effect in terms of general mechanical ability. Such results would admittedly be difficult to document, but should not be ruled out as worthy of consideration. Any study along such lines would necessarily be very detailed in examining local industrial/ mechanical enterprises. Finally, the relation of Grafton to the surrounding rural areas could be approached from several directions. Most obvious is the demographic, that is, how much "pull" did the town exert on local residents - especially the young? Secondly, in institutional terms, how were political and religious organizations affected by town growth? This aspect might be investigated through the use of land and voting records, as has been done for the certain Midwestern states.[25]

In all such studies, the visual record provides an important element in the overall picture of urban and industrial development in the wake of the railroad. The continuous existence and usefullness of the original machine shop building is part of that story. As such, it is an important document in the history of the region and of the Nation as a whole.

FOOTNOTES

1. Milton Reizenstein, "The Economic History of the Baltimore and Ohio Railroad, 1827-1853," Johns Hopkins University Studies in Historical and Political Science, Vols. VII-VIII (Baltimore, 1897), p. 67.
2. Edward Hungerford, The Story of the Baltimore and Ohio Railroad, 1827 1927 (New York, 1928(, pp. 245-250.
3. Ibid, p. 249.
4. Reizenstein, pp. 69-72, 80; Baltimore and Ohio Railroad. Reports of the Majority and Minority of a Special Committee of the Baltimore and Ohio Railroad to Investigate Its Financial Condition, General Line of Policy Heretofore Pursued (Baltimore, 1858).
5. William Powell Smith, Great Railway Celebrations of 1857 (New York, 1858) pp. 73-75; Hungerford, p. 293.
6. Smith, p. 73.
7. Northwestern Virginia Railroad, 6th Annual Report (Baltimore, 1857), p. 20.
8. Smith, p. 75.
9. Baltimore & Ohio Railroad, Report of the Finance Committee of the Baltimore and Ohio Railroad (Baltimore, 1865) p. 19.
10. Frederick A. Cleveland and Fred W. Powell, Reilroad Finance (New York, 1912) p. 73.
11. Northwestern Virginia Railroad, Third Annual Report (Baltimore, 1854) pp. 17-18.
12. Carl Condit, American Building Art, The 19th Century (New York, 1960) pp. 130-162.
13. Northwestern Virginia Railroad, 5th Annual Report (Baltimore, 1856) p. 15.
14. B&O Railroad, Majority and Minority Report, p. 22.
15. Charles Brinkman, "The History of Taylor County," Grafton Sentinel, May 5, 1939, p. 4.
16. Brinkman, June 19, 1939, p. 4.
17. Baltimore and Ohio Railroad, Annual Report (Baltimore, 1875), p. 47.
18. Ibid.
19. Brinkman, April 21, 1939, p. 4.

20. Brinkman, June 19, 1939, p. 4.

21. Robert S. Woodbury, Studies in the History of Machine Tools (Cambridge, Mass., 1972), pp. 48, 117-119.

22. Brinkman, May 19, 1939, p.4.

23. United States Census Office, Twelfth Census of the United States, Part I, Vol. I (Washington, 1901), p. 478. In 1960, Grafton's population was 5,791. 18th Census of the United States, Vol. I, Part A (Washington, 1961), Ch. 50, p.14.

24. Hungerford, pp. 195-296.

25. Paul Kleppner, Cross of Culture: A Social Analysis of Midwestern Politics, 1850-1900, (2nd Ed.), (New York, 1970).

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